CASE STUDY FOR ONBOARD SAFETY MEETING
ENGINE ROOM FIRE AND FAILURE OF FIXED FIRE FIGHTING SYSTEMS

Please read the below description of an incident. Keeping your company's standards and vessel procedures in mind while reading to compare with the actions of the crew below. We will discuss the factors which led to the incident occurring and how to avoid it happening on our vessel.

An ultra large container ship was on a voyage from Singapore to Hong Kong. At 2154 hrs the low fuel pressure warning alarm sounded and eighteen seconds later the fire alarm for the engine room activated. The Chief Engineer entered the engine room to investigate and noticed flames coming from Auxiliary Engine #1 (A/E1). The quick closing valves were immediately activated. The engine room water mist system had failed to operate. Members of the crew tried to investigate the failure of the water mist system but were unsuccessful. Inspite of that, the engine crew successfully extinguished the fire at 2206 hrs using dry powder extinguishers.

Following an inspection of the engine room, it was decided to restore the main power. A/E3 was started at 2230 hrs and within one minute, heavy smoke was again seen coming from the engine room. the Chief Engineer noticed that the fire in A/E1 had reignited. He tried to extinguish it using a portable extinguisher but was unable to control it. The water mist system had again failed to operate. The engine crew was mustered and the decision was made to release the fixed CO_2 system. The Chief Engineer released the fixed CO_2 remotely from the fire station at 2243 hrs. To make sure that CO_2 had released, the Chief Engineer and the 2nd Engineer went to the CO_2 room to check. In the CO_2 room, they found that several CO_2 cylinders and manifold heads remained frost free and warm indicating that some of the cylinders had not been discharged. There was also a bottle leakage alarm that they failed to notice.

Meanwhile the temperature in the engine room continued to rise. At 2300 hrs the 2nd Engineer donned breathing apparatus and entered the CO_2 room to release the cylinders manually. Approximately half an hour later the temperature in engine room was seen to be reducing and the fire was later confirmed to be extinguished. The vessel then had to be towed to the nearest safe port for repairs.

Main findings of the investigation were:

Cause of fire and reignition:

- The first fire was caused by fuel spilling onto unprotected hot surfaces from a fractured fuel pressure sensing line on the main inlet fuel supply line serving A/E2. This pipe that had been fabricated onboard and was of inferior specification. This pipe was also not properly supported from the original design and was exposed to excessive vibration leading to fatigue cracks. The maker had issued service letters notifying owners of the risk of fatigue cracks and oil spill from this pipe.
- On the cause of reignition, the report said it was either caused by the reinstatement of the fuel supply or energizing of the main switchboard once the A/E3 was started.

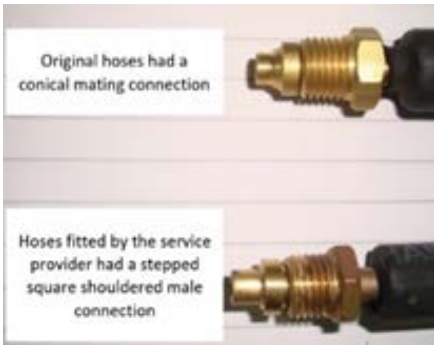
Locally fabricated fuel pressure line

Failure of the water mist system:

- For auto activation, the system required detection by two flame detectors. In this case only one flame detector activated probably because the other was covered by fuel mist.
- Another important finding was that the system did not activate since the crew did not notice the operation mode was set to 'manual' on the local control stand. This was done during previous maintenance work on the engine. The crew were not aware of how to override or rectify this.

Failure of fixed CO2 system:

- Out of the allocated 397 cylinders, only 170 cylinders had been fully discharged.
- The fixed CO_2 system was inspected and serviced by a classification society approved third party service provider one year before the incident.
- During servicing, they changed all the flexible hoses for the pilot actuators and the discharge lines.
- The new flexible hoses had a different connection profile than the hoses installed originally , as shown in the image.
- A system pressure test was performed during the investigation, and it was noted that the new flexible hoses did not form a sufficiently robust or effective seal on the pilot air-line. Leaks were detected in all connections.



CO_2 flexible hose couplings

If you have any questions or comments please contact Gard's Loss Prevention team at lp@gard.no

HOW TO IMPROVE BY LESSONS LEARNT

Based on the case and the keywords, you should now perform an onboard risk assessment of the incident and the factors which led to it. Bear in mind your vessel's procedures. You can also discuss the keywords below in order to determine onboard areas/topics for increased awareness:

- What are the Company's procedures for identifying and adequately protecting all hot surfaces in the engine room? Also discuss why is it important to protect the hot surfaces?
- Identify all locally constructed piping in fuel systems in engine room? How do you ensure that these pipes are not of inferior specification? Discuss whether there is any policy in the Company for such matters.
- How is it ensured that parts installed by third party service providers on the fixed firefighting systems are not different from the parts originally installed? Are there any procedures on this or work instructions in the PMS to guide the crew onboard?
- How and how often do you test if the Water mist system (if installed onboard) is working? Do crew members learn and understand how to manually release the system, if deemed necessary.
- What things would you consider or check for before restoring power on the ship after a fire in the engine room?

1 What factors contributed to the incident on board the vessel?

2 Risk Assessment: Could some of the risk factors be identified on board your vessel? What is the likelihood and severity of those risk factors?

3 What measures would you suggest in order to mitigate the risk that could lead to such incidents? Any additional barriers of safety that could be introduced?